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Conference Abstract

Customized e-floras: How to develop your own project on the Pl@ntNet platform

Antoine Affouard[‡,§], Mathias Chouet[‡,§], Jean-Christophe Lombardo[‡], Hugo Gresse[‡,§], Hervé Goëau[§], Titouan Lorieul[‡], Pierre Bonnet[§], Alexis Joly[‡]

‡ Inria (National Institute for Research in Digital Science and Technology), LIRMM, Montpellier, France
§ AMAP (botAny and Modeling of Plant Architecture and vegetation), Univ Montpellier, CIRAD, CNRS, INRAE, IRD, Montpellier, France

Corresponding author: Pierre Bonnet (pierre.bonnet@cirad.fr)

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Abstract

Pl@ntnet is a citizen observatory that relies on artificial intelligence (AI) technologies to help people identify plants with their smartphones (Joly 2014). Over the past few years, Pl@ntNet has become one of the largest plant biodiversity observatories in the world with several million contributors (Bonnet 2020b). Based on user demands, a set of tools and services following the FAIR (Findable, Accessible, Interoperable, Reusable) principles (Wilkinson 2016) were implemented to allow the development of e-floras. After a short description of the platform (see Joly (2015) and Joly (2016) for details), we present three complementary services dedicated to the customization of e-floras.

The general workflow of Pl@ntNet can be divided into three main components. First, the Pl@ntNet mobile Android and iOS apps, dedicated to plant identification, allow both anonymous and authenticated users to take a picture of a plant, and to send it to a server for recognition at the species level. This recognition, which is performed by a convolutional neural network (Affouard 2017), allows the user to get a list of candidate species, each associated with a confidence score. The second component of Pl@ntNet's workflow is the enrichment of the database to improve the observation quality of the data collected. Because of the huge volume of data (over four million observations shared in 2020, Pl@nt Net statistics), this enrichment cannot be done solely by expert botanists. This is why

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various crowdsourcing mechanisms have been put in place allowing the collaborative curation of the data. The third part of the Pl@ntNet workflow is the exploitation of the database, which is made available for the needs of stakeholders such as researchers. For example, the recent sharing of Pl@ntNet data on GBIF's (Global Biodiversity Information Facility) platform, through two complementary datasets, has increased the benefit to the scientific community (examples are available here).

To support the development of customized e-floras, three complementary concepts have been developed: micro-projects, groups, and monitoring work spaces, whose services are detailed below:

(a) **Micro-projects** allow full adaptation of all the interfaces of the Pl@ntNet apps to a species list of interest. This e-flora can be linked to a specific geographical area, which allows it to be automatically selected according to the user's location. When several specific geographical areas overlap for a given geolocation, the smallest one is automatically selected. This adaptation increases the accuracy of the identification, as the number of potential species for a given identification request is reduced to the checklist of the micro-project (e.g., Bonnet (2020a)). Up to now, 12 micro-projects adapted to European, African or Asian contexts are running on the platform. A full description of this service is provided in Bonnet (2020c). The API (Application Programming Interface) for the identification service of each e-flora is available on My-Pl@ntNet.

(b) **Groups** allow any user to create a private or public space on the platform (https://identify.plantnet.org/groups), to permit everyone to aggregate a part or all of their observations in the group. A group is "observation-centered" as opposed to a micro-project, which is species-centered. If the group is public, any authenticated user can join and contribute to it; if it is private, only users validated by the group's moderators can become members. When a group is restricted to a specific geographical zone (such as a school, city, or natural area), only observations found in that area are displayed in the group, contrary the micro-project. As all the group's observations can be downloaded (as tabbed or comma separated values) by any of the group's members, group features can be used to conduct statistical analyses on the data in order to study plant plots, plant phenology or user profiles. These groups are used by people who want to structure the activity of a group of people interested in monitoring the biodiversity of a given area, a taxonomical group, or a type of plant habitat. Over 260 groups have already been created by e.g., professional land managers, educators, and plant enthusiasts.

(c) **Monitoring work spaces** allows a given stakeholder to access all the observations and identification requests of a given species list in a particular area. Micro-projects and Groups only allow exploration of plant observations explicitly shared by the authenticated users. However, Pl@ntNet's database contains hundreds of millions of plant identification requests submitted by anonymous users. Monitoring work spaces was set up to allow access by land managers to this rich and important material. These work spaces provide the maps, the list of plant observations, and identification requests (with a very high confidence score on the species identification), for all the species of interest to a given partner. For example, this service has been mobilized to follow the recent development of

an invasive species (i.e., *Hakea sericea* Schrad. & J.C. Wendl.) in and around a natural reserve on the Mediterranean coast.

All of these on-demand e-floras and monitoring services accelerate the use of daily-produced data, and inform land managers and scientists of the changes in the floristic composition of monitoring areas.

Keywords

AI-based identification, citizen science observatory, plant monitoring

Presenting author

Pierre Bonnet

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References

- Affouard A, et al. (2017) Pl@ntnet app in the era of deep learning. ICLR. International Conference on Learning Representations., Toulon, France, April 24 - 26, 2017.
- Bonnet P, et al. (2020a) Contribution citoyenne au suivi de la flore d'un parc national français, un exemple remarquable à l'échelle du Parc national des Cévennes. Carnets Botaniques1-9. https://doi.org/10.34971/zaz0-n247
- Bonnet P, et al. (2020b) Pl@ntNet Services, a Contribution to the Monitoring and Sharing of Information on the World Flora. Biodiversity Information Science and Standards 4 https://doi.org/10.3897/biss.4.58933
- Bonnet P, et al. (2020c) How citizen scientists contribute to monitor protected areas thanks to automatic plant identification tools. Ecological Solutions and Evidence 1 (2): e12023. https://doi.org/10.1002/2688-8319.12023
- Joly A, et al. (2014) Interactive plant identification based on social image data. Ecological Informatics 23: 22-34. https://doi.org/10.1016/j.ecoinf.2013.07.006
- Joly A, et al. (2015) A look inside the Pl@ntNet experience. Multimedia Systems 22 (6): 751-766. https://doi.org/10.1007/s00530-015-0462-9
- Joly A, et al. (2016) Crowdsourcing Biodiversity Monitoring. Proceedings of the 24th ACM international conference on Multimedia https://doi.org/10.1145/2964284.2976762

- Wilkinson M, et al. (2016) The FAIR Guiding Principles for scientific data management and stewardship. Scientific Data 3 (1). https://doi.org/10.1038/sdata.2016.18